

REMARKS

In the Office Action, the Examiner rejected the claims under 35 USC §102. The claims have been amended to further clarify the subject matter regarded as the invention. Applicant reserves the right to reintroduce claims of the same or similar scope. The rejections are fully traversed below. Claim 61 has been added. Claims 1 and 3-61 are now pending.

Reconsideration of the application is respectfully requested based on the following remarks.

REJECTION OF CLAIMS UNDER 35 USC §102

In the Office Action, the Examiner has rejected claims 1-11, 13, 16, and 17 under 35 USC §102(e) as being anticipated by Lo et al, U.S. Pub. No. 2002/0103943 A1, ('Lo' hereinafter). This rejection is fully traversed below.

The claimed invention supports implementing virtualization of storage in a storage area network. This is accomplished through the use of one or more network devices capable of being placed in a data path between the hosts and the storage devices. As a result, neither the storage devices nor the hosts require additional software or hardware to support storage virtualization. Moreover, the present invention enables multiple network devices to simultaneously manage the virtualization of heterogeneous storage devices.

In accordance with one aspect of the invention, the present invention is implemented on a per-port basis, as claimed in claims 4 and 18. In other words, selected ports of one or more network devices may implement virtualization functionality in hardware and/or software. Any number of ports on a switch can manage virtualization of its own traffic. This allows a network's virtualization capacity to scale with the number of ports. Since there are large numbers of ports in any network system, there will nearly always be sufficient bandwidth for virtualization. Accordingly, the present invention provides far greater

bandwidth for virtualization than can be provided with host based or storage based virtualization schemes.

In accordance with another aspect of the invention, as claimed in claims 21-28, a port may submit a lock request to another “master” port that manages all lock requests. This master port may also notify the requesting port when a lock request has been granted. The master port may similarly process “lock release” requests.

Lo discloses a distributed storage management platform architecture. See title. Lo does disclose the concept of storage virtualization. See paragraphs 0037, 0239. The behavior disclosed in Lo is storage network router-based, rather than being housed in the hosts, or in the storage arrays/subsystems. See paragraphs 0247, 0048-0049.

With respect to claim 4, as amended, steps “(b), (c), and (d) are performed by logic dedicated to and implemented by said port of the network device.” The Examiner cites paragraph 0225 of Lo. It is important to note that while paragraph 0225 discusses ports in general, Lo fails to disclose logic dedicated to and implemented by a port of the network device. Rather, as shown in Figure 1 of Lo, a host side interface controller is associated with a number of ports, while a storage side interface controller is also associated with a number of ports. Thus, logic is not dedicated to and implemented by a port of the network device. Accordingly, Applicant respectfully submits that Lo fails to anticipate the invention of claim 4.

In the Office Action, the Examiner has rejected claims 1, 12, 14, and 18-60 under 35 USC §102(e) as being anticipated by Blumeneau, U.S. Patent No. 6,260,120, (‘Blumeneau’ hereinafter). This rejection is fully traversed below.

Blumeneau relates to storage mapping and partitioning among multiple host processors in the presence of login state changes and host controller replacement. See title. A storage controller is programmed to define a respective specification for each host processor of a respective subset of the data storage to which access by the host processor is restricted, and each specification is associated with a host identifier stored in the memory. When the storage controller receives a data access request from a host processor, it decodes a host identifier from the data access request, and searches the memory for a host identifier matching the host identifier decoded from the request. Upon finding a match, the respective

specification of the respective subset for the host processor is accessed to determine whether or not storage specified by the storage access request is contained in the respective subset. If so, then storage access can continue, and otherwise, storage access is denied. Preferably, the host identifier decoded from the request is a temporary address assigned by the network, and also stored in the memory in association with each respective specification is a relatively permanent identifier for the host processor. See Abstract.

Blumenau neither discloses nor suggests the claimed invention. As shown in Fig. 22 and described in col. 26, lines 1-24, a cached storage subsystem 250 implementing virtual ports 268 includes two port adapters 260 and 261, each having two physical ports. The port adapters are programmed to provide respective virtual switches linking their physical ports to a set of virtual ports. As shown in Fig. 7, the cached storage subsystem 20 appears to include a single network device having a cache memory 32 accessible by both port adapters. This is further emphasized in col. 9, lines 25-29, stating “in a preferred form of construction, the cache memory 32 is composed of dynamic RAM memory cards mounted in a card-cage or main-frame, and the port adapters and storage adapters are programmed micro-processor cards that are also mounted in the card-cage or main-frame.”

As set forth above, Blumenau neither discloses nor suggests implementing storage virtualization, as claimed, on a network device. While Blumenau does disclose the mapping of LUNs to logical volume numbers (see col. 22, lines 60-67), Blumenau fails to disclose the claimed inventions as implemented in a network device, wherein the network device is a switch, router, iSCSI gateway, or other network node configured to perform a switching function.

The claims also recite additional limitations that further distinguish them from Blumenau. For instance, with respect to claim 18, Blumenau fails to disclose a method “wherein (b), (c), and (d) are performed by a processor dedicated to only said port of the network device.” Since Blumenau fails to disclose the claimed limitations performed by a processor dedicated to only one port of the network device, where the network device is a switch, router, iSCSI gateway, or other network node configured to perform a switching function, Applicant respectfully submits that Blumenau fails to anticipate the invention of claim 18.

As another example, with respect to claim 19, Blumenau fails to disclose requesting a lock of the one or more physical storage locations. Rather, col. 29, lines 6-30 merely disclose

that the “fixed port option” would be selected if it is desired for a host controller port to access the specified virtual port only through a specified one of the physical “A” or “B” ports of the port adapter. While col. 15, lines 11-15 disclose the use of a private/shared flag, this flag corresponds to logical volumes rather than physical storage locations. Accordingly, Applicant respectfully submits that Blumenau fails to anticipate the invention of claim 19.

Moreover, with respect to claim 21, Blumenau fails to disclose sending a lock request to another port of a network device. Rather, Blumenau appears to disclose that locking and unlocking is performed by the cached storage subsystem, rather than contacting another port of a network device. Accordingly, Applicant respectfully submits that Blumenau fails to anticipate the invention of claims 21-28.

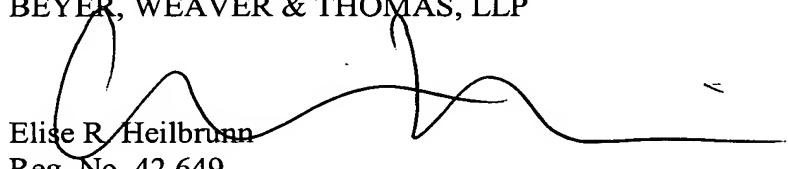
Applicant therefore respectfully submits that each of the cited references fails to anticipate the independent claims. The dependent claims depend from one of the independent claims and are therefore patentable for at least the same reasons. However, the dependent claims recite additional limitations that further distinguish them from each of the cited references. The additional limitations recited in the independent claims or the dependent claims are not further discussed, as the above discussed limitations are clearly sufficient to distinguish the claimed invention from the cited reference. Thus, it is respectfully requested that the Examiner withdraw the rejection of the claims under 35 USC §102.

SUMMARY

If there are any issues remaining which the Examiner believes could be resolved through either a Supplemental Response or an Examiner's Amendment, the Examiner is respectfully requested to contact the undersigned attorney at the telephone number listed below.

Applicants hereby petition for an extension of time which may be required to maintain the pendency of this case, and any required fee for such extension or any further fee required in connection with the filing of this Amendment is to be charged to Deposit Account No. 50-0388 (Order No. ANDIP003).

Respectfully submitted,
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